DOCUMENT RESUME

ED 100 449 JC 750 078

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TITLE An Investigation of the Relationships Between Personal Dimensions and Program Success in Medical Laboratory Technology.
PUB DATE Apr 74
NOTE 47p.; Practicum presented to Nova University in partial fulfillment of the requirements for the Doctor of Education degree

EDRS PRICE MF-$0.75 HC-$1.85 PLUS POSTAGE
DESCRIPTORS Health Occupations Education; Intellectual Development; *Junior Colleges; Junior College Students; *Laboratory Technology; *Learning Theories; Medical Technologists; *Personality Assessment; Student Characteristics; *Success Factors
IDENTIFIERS Omnibus Personality Inventory

ABSTRACT

This study assesses the curriculum strategies indicated by the intellectual orientation and personality dimensions of students in a Health Technology Program at a community college. When designing curriculum, educators in allied health programs frequently overlook the characteristics of the students the program must serve. This study explores the influence of several dimensions of personality, as measured by the Omnibus Personality Inventory, and the effect these behavioral attributes might have on academic success. The Inventory Instrument uses 14 scales to measure personality and intellectual dispositions. The mean and standard deviations for each scale of the Inventory and Grade Point Average were plotted for the students, and the composite student (or mean score) was plotted on an Inventory Graph, showing the distribution of students in medical laboratory technology by types and degrees of learning orientation. The practicum presents a learning process for medical laboratory technology students based on program goals and student characteristics including a sample program for learning hematology. The author suggests that the results and the recommendations from this practicum are applicable to other associate degree health technology programs. (Author/MJK)

U.S. DEPARTMENT OF HEALTH
EDUCATION & WELFARE
NATIONAL INSTITUTE OF
EDUCATION

ED100449

AN INVESTIGATION OF THE RELATIONSHIPS BETWEEN PERSONAL DIMENSIONS AND PROGRAM SUCCESS IN MEDICAL LABORATORY TECHNOLOGY

by

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A PRACTICUM PRESENTED TO NOVA UNIVERSITY IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE DEGREE OF DOCTOR OF EDUCATOR

NOVA UNIVERSITY

APRIL 10, 1974

JC 750 078

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INTRODUCTION

This study examines the intellectual dispositions, personality dimensions, aspirations, family data, and grade point average of students in a community college program for one of the allied health professions, namely Medical Laboratory Technology. I hypothesize that learning is a process whereby the abilities of students become differentiated through experiences which meet the needs of the student as well as the profession which they are preparing to enter.

Educators engaged in designing curricula for community college based programs of the Allied Health Professions frequently overlook the characteristics of the students these programs must serve. The goals, curricula, and instructional strategies attempt to modify the behavior of students to enable them to perform effectively in the unique clinical settings of the health professionals. Our educational efforts to achieve professional competencies are based on tasks analyses of practicing professionals, holding bachelor or higher degrees.

When the community college student encounters our instructional strategies, his behavior modification will be limited or enhanced by the nature and degree of his response. In order to develop a meaningful educational program we must discover the expectations, motivations and perceptions of our students.

I am proposing a synthesis of learning theories based on the expectation that characteristics of community college students and the professional requirements of allied health are reconcilable in the learning processes and program goals of community college programs.

BACKGROUND AND SIGNIFICANCE

It is axiomatic among learning theory psychologists that each individual engaged in classroom activities differs from every other individual so engaged in ways that are related to what he learns through these activities. Following Piaget's model, Dr. C. Kamii makes this point, "If we really want children to learn, the process of interacting with the environment must be emphasized rather than a specific response already selected by the teacher."(1)

An individual's complete personality pattern, including his cultural background, intellectual disposition, aspirations, anxieties, drives and motivational traits is neither divisible into parts nor static. Changes in individuals occur with age and with experience. The developing individual responds to multitudinous stimuli in his environment and his perceptions of the events to which he is exposed. The cognitive development, abilities, skills, interests, values, and goals a student brings to college seriously affect his opportunity to learn.

The Community College, which is alert to student choice trends and community agencies' staffing needs, invariably proliferates a growing number of programs of allied health careers. Programs for Medical Laboratory Technicians are among the health technologies which have the responsibilities for preparing competent personnel.

It is our contention that if health career programs succeed in

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(1) Don E. Hamachek, Human Dynamics in Psychology and Education, 2nd Edition (Boston, 1972), page 543.

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producing skilled paraprofessionals to fill the needs of community health agencies, we must appraise our students and modify our instructional strategies appropriately.

No single program can really represent the total spectrum of allied health, nevertheless this research and its implications for education in medical laboratory science are applicable to the major philosophic commitments of the allied health movement in community colleges. The primary role of an allied health program is to supply the manpower for one aspect of health care. Program goals must accomodate the proficiencies of the health professionals. And the practicing health professionals have defined their needs in terms of patient care, which understandably is their major concern. In designing program goals we have shown less concern for the student whom we expect to reach our goals than for the expectancies of his future employers. It is important for educators to modify program goals to meet student needs without sacrificing excellency. This can only be done by assessing the student whom the program serves and providing him the appropriate learning activities.

Usually individual program goals are based on a task analysis. This makes it imperative that we understand the task analysis is largely defined by the competencies and skills which individuals have gained from academic experience in a baccalaureate program followed by varying years of clinical experience. We would be remiss if we did not keep this fact and its importance to our educational strategies in mind.

Essentially the philosophy of allied health education requires unity, flexibility, and competency. The concept of unity is exemplified in medical technology by the career ladder approach and by articulation between all levels of educational preparation. The concept of flexibility relates the program goals to the characterisitcs of its students and the needs of the community agencies. The concept of competency requires a learning theory which fosters dynamic interaction between the cognitive, attitudinal, and psychomotor input and the desired professional outcomes. If students in allied health programs are to succeed, the factors that reside in the backgrounds of our students and the factors that reside in our programs must be the basis for upgrading achievement.

Certainly, the theory of learning which bridges the gap between the entering student and the graduate of an allied health program must consider the qualities health educators value. In medical laboratory science, as in other medical sciences, precision and accuracy are the hallmark of the professional. Additionally in any science, whether applied or basic, creativity is valued and must not be sacrificed. Psychomotor skills and efficiency in their use, which will transfer to new situations, are needed in mastery of the changing technological instruments which paraprofessionals will operate. Furthermore, judgement and evaluation are not only concepts but become tools in the activities which apply to laboratory procedures and patient care. The concept of privileged communication, which is only a small part of professional conduct, must be learned and, furthermore, valued. Patient

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care as an ongoing, twenty-four hours a day, seven days a week continuum must be presented; or put another way, concern for the patient's welfare must be inculcated.

Because of the many facets of the task health educators face, a learning theory appropriate for them must focus on the technology of instructions. We require a learning theory which will apply to either simple or complex tasks, stated in behavioral terms, and which will improve the efficiency of the learning.

Health educators who work on the applied problems of teaching proficiency in a skill meeting standards of time and error are in the position of a widow responsible for a number of children. This person cannot afford to be mistress of one but must shop around for a marriage which will support her responsibilities. So it is with the health educator and learning theories. We must choose wisely the one which will answer our particular purpose. I am proposing not one particular theory but a synthesis of learning theories to develop the qualities valued by persons in health technologies.

Hilgard and Bower quote Glaser's conclusion, "What we need is an integration of a task analysis and the pertinent learning variables. Without a task analysis we will never know how to apply what we have discovered about learning."[2] The health educator must train toward objectives that are not choosen by him but are dictated by the actual demands upon the learner in terms of a task analysis. Given the role requirements of the

(2) Hilgard and Bower, Theories of Learning, Century Psychology Series, Appleton-Century-Crofts - Page 244.

middle level professional and the community college student, the health educator must discover a learning situation which yields both a competent employee and a person who discovers a reason and basis for a satisfactory life style.

What support has learning theory to offer the health educator as he provides for his responsibilities? First we must differentiate between education and training. Once we isolate the highly specific skills our students need then we can devise objectives by which training will be achieved. Next we must define the objectives by which individual potential will be expressed. If we maximize individual differences through self discovery without weakening the technical content of the health technology, then we will meet student needs without sacrificing excellency.

To accomplish this our proper focus is the learner and what he can do with what he has learned. What can our student generate from what he knows? How well can he leap the barrier from learning to performing, evaluating, and continuing to learn? We begin with the community college student in the health technologies who has passed an aptitude test or failing that has succeeded in a remedial program prior to program admission. Not very surprisingly, our average student has scored close to the national mean on the fourteen scales of the Omnibus Personality Inventory. He has earned a Grade Point Average of 2.66 and if he has reached the sophomore level he plans to complete his program of studies. Our dilemma is to challenge the more able students and to reinforce and

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encourage the less able. We require a view of learning and a set of learning variables related to the theory in order to do this.

Application of Learning Theory to Health Technology

We shall examine the various attributes and skills our students need and develop a hypothetical construct from learning theories which will serve to integrate and lend coherence to health technology instruction. What a student is asked or required to do determines what he will learn and how he will change. A curriculum rooted in learning theory will be modified to accomodate the psychological forces created by the individual's personality and the college's organization.

Thinking Introversion. In science, whether it be applied or basic, thinking introversion is expressed in dealing with abstract ideas and divergent information. Mastery and application of scientific concepts are important qualities to health technologists. When the inherent organization of an instructional strategy is systematically planned to offer practice in discovery, productive thinking and problem solving are facilitated.

We shall borrow from Gagne's heirarchial approach to problem solving and place our learning experiences in sequential steps. Just as it is true that complex rules depend upon prior learning of simpler rules, so also a final task of problem solving may be shown to derive facilitation from previously learned rules. "..... the final task of such a hierarchy is presented with little verbal guidance and, therefore, aids the character of a problem

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solving task."(3) By designing a learning hierarchy of subordinate and supportive tasks, we encourage students to enter at the level of their competence. We do not disclose the final task to the student, but we make certain that all students perform all but the final task before attempting it. The final task of our hierarchy must have the characteristics of a problem solving activity and all students must be given an opportunity to *discover* the solution.

Theoretical Orientation. Theoretical orientation means an interest in or a preference for dealing with theoretical concerns and for using scientific methods. Because we accept that concepts must be extracted from experience, and because Skinner's Operant Conditioning Theory places learning under the experimenter's control we shall advocate programmed learning to teach concepts. Programmed learning provides sequential steps which the learner masters at his own pace. Hilgard and Bower consider that the "....programmed material is better adapted to more complexly structured bodies of materials in which what is learned later depends upon what has been learned before."(4) It has the further advantage of serving our varied student population by individualizing instruction. More importantly perhaps, sharp distinctions are necessarily distinguished as the learner connects each concept in a sequenced frame. Later when the student works in the classroom laboratory this concept will become operational and subsequently will transfer to a new situation through operation in that situation.

(3) Gagne, Robert M., The Conditions of Learning. Holt, Rinehart, Winston, 1970, Page 232.

(4) Hilgard and Bower, Theories of Learning. Century Psychology Series, Appleton-Century-Croft, Page 560

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Complexity. Complexity is an intellectual disposition to value experimental and flexible ways of viewing and organizing phenomena. Probably how to make our gains cumulative for future use is one of our most difficult tasks. Flexibility and experimentation derive from insight. How may we teach insightfully? For this attribute we turn to the Cognitive-Field Theory of Learning to gain our own insights into the problem. Morris L. Bigge gives us the key to our problem, "Within cognitive-field theory, learning, briefly defined, is an interactional process within which a person attains new insights or cognitive structures or changes old ones. In no sense is it a mechanistic associationistic process of connecting stimuli, which impinge upon, and responses, which are evoked or emitted, from a biological organism."(5) Now let us examine how we may teach medical laboratory science insightfully. We must view the student as the center of our instruction. Cognitive-field theorists are concerned with outward behavior only insofar as it reveals what is transpiring psychologically or perceptually. According to cognitive-field psychologists the only reality a man can ever know, or use, is his interpretation of experience.

Bigge states, "Hence, intellectual processes are deeply affected by an individual's goals, and learning activity including habit formation, is goal directed."(6) We know our "mean" student's goal - it is to become a practicing health technologist.

(5) Bigge, Morris L., Learning Theories For Teachers, 2nd Edition, 1971 Harper & Row, Page 199

(6) Gagne, Robert M., Military Training and Principles of Learning. American Psychologist XVII, February (1962) pp. 83-91.

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Cognitive psychologists emphasize the person and the reality of his life space; our task is to provide experiences through which our student's interact and expand their environment. From his best interpretations of these events our student will derive insights. They will serve as dependable guides for his future.

For the health technologist instructor this means the student must have ample directed clinical experience in a real-life situation. When exposed to patients and the services of patient care, and with an everpresent instructor to explain and coordinate the instructional goals and objectives, the student will gain insights into his choosen role. Objectives for clinical experiences must provide students an opportunity to differentiate tasks, to generalize perceptions of health care, and to learn through experience what actions lead to what results. The student becomes a restructured person capable of continual differentiation, generalizations, and continual restructurization; to wit - flexible, experimental, and insightful.

Acquisition of the Skills of Health Technology. Although a skill is a motor learning task nevertheless the learning of skills corresponds in some ways to verbal learnings in that cognitive processes are heartily involved. The difference is that in learning skills we are interested in a process approach. Our problem then is learning experiences which will enable our student to bridge the gap between uncertain attempts and competent performance.

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The question we must answer is how can learning theory be put to use in designing maximally effective training procedure?

The most analytical discussion of the relationship of principles of learning to an elaborate technology, applicable to health technology, has been presented by Robert M. Gagne, The American Psychologist.[7] We have adapted his understandings of military training to develop a theory for training procedures in health technology. We propose that management of learning skills to health technologies requires these activities:

1. A task analysis must be made and elements of work identified.
2. Elements of work or tasks should be analyzed into component or microelements of work.
3. Microelements may be learned in different ways and require a variety of instructional practices.
4. The component microelements of a task must be mastered before the student proceeds to the subsequent task and attempts the final task.
5. The microelements must be placed in a hierarchy of learning tasks and must be presented as a whole to the student before he enters the hierarchial learning chain.

Acquisition of Professional Attitudes. Individuals vary in their motivation to succeed, in anxiety, need for achievement, and level of aspiration. From Green's statement, "Attitudes are associated with many of the social and cultural factors affecting personality."[8] I theorize that ethics and professional conduct are learned through social and cultural experience.

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(7) Gagne, ibid., Page 216

(8) Green, Donald R., Educational Psychology, Prentice Hall, Englewood Cliffs, New Jersey, 1964, page 103.

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Carl Rogers contributes our specific orientation, "Briefly it may be put that the observed phenomena of change seems most adequately explained by the hypothesis that given certain psychological conditions, the individual has the capacity to reorganize his field of perception, including the way he perceives himself, and that a concomitant or a resultant of this perceptual reorganization is an appropriate alteration of behavior."(9)

If we are to inculcate ethical behavior and professional concern we must write behavioral objectives for the desired behavior and measure change by our stated criteria.

In support of this relation of the student's self to his experience, through experience the student will be able to reorganize his perception, restructure himself and change his behavior to the appropriate professional response. Through opportunities to practice the professional role the student will identify its values and through use internalize them.

Judgement and Evaluation. It is reasonable to suggest that the sum total of the learning activities and the personality factors that influence learning themselves operate at this level.

I suggest we view learning to judge and to evaluate as a microcosm of intellectual development. It begins with instrumental activities in which procedures define concepts. These operations become internalized in a symbolic notation that remains constant in various situations and imagery. Through use and application of principles the learner gradually grasps the expected outcomes of a wide variety of procedures. Once the principles, concepts, and abstractions are mastered, the student becomes able to judge and evaluate the results of his or others' efforts. He

(9) Hamachek, op, cit. page 537.

has behavioral objectives and performance criteria from previous experiences to apply to the new situation.

The Nature of the Theory of Instruction for Health Technology. It is beyond the scope of a practicum to encompass all the aspects pertinent to learning a health technology. The major ideas are:

(1) The theory is in reality a prescription drawing on many sources for therapy.

(2) The theory is a yardstick for measuring instructional methods.

(3) The theory specifies ways for accomodating the needs of community college students and health professionals in goals.

(4) The theory encourages innovation and exploration in students, instructors, and theorists.

PROCEDURES

The Omnibus Personality Inventory and the Questionnaire were administered to sixty-nine students enrolled in the Associate Degree Program for Medical Laboratory Technicians. The results of the Intellectual Disposition Scales: Thinking Introversion, Theoretical Orientation, and Complexity were tabulated and their relation to Grade Point Average investigated. The study was designed to assess the relative heterogeneity of certain personality measures and personal data among the successful students majoring in medical laboratory science.

RESULTS

The raw scores on the various scales of the OPI, which was administered to sixty-nine students in medical laboratory science, varied widely. This wide distribution of scores and the students cumulative grade point average appear in Table I. We shall restrict our examination to the relation of three intellectual disposition scales and academic success; although Estheticism is listed as one of the Intellectual Dispositions it is not prerequisite to an applied science. Our primary interest focuses on Thinking Introversion (TI), Theoretical Orientation (TO), and Complexity (CO) because of their importance to the application of learning theory to health technology.

The mean score of our student population on the OPI scales rather closely parallels the mean of the normative sample. The lower score on the Masculine - Feminine Scale possibly reflects the high number (75%) of women in the program. From the mean score on the OPI scales and the cumulative grade point average which are plotted in Figure 1, we see our student population is fairly typical of community college students.

From the Office of Institutional Research we learned that the mean Grade Point Average for all degree students at Florida Junior College is 2.48. The mean Grade Point Average for students in the Medical Laboratory Technicians Program is 2.66, which is 0.18 points above the average.

Of the study group thirty percent have withdrawn from the program, twenty one percent either have or will graduate by the end of the school year, and forty-nine percent indicate they expect to complete their program of studies. All of the students who scored above the mean on complexity or autonomy have continued in the program. (Table II)

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None of the women students who are married have withdrawn from the program and only two of the married men have withdrawn.

Forty-eight percent of the students responded positively to the questionnaire item relating to aspiration to a Bachelor's Degree; however in a recent follow up of the program graduates, we find only approximately fifteen percent of the students so engaged.

Sixty-five percent of the study group is under twenty-one years of age and seventy-two percent of the study group selected their present years as their happiest. One might interpret this choice as indicating that the success the students are experiencing in school is reflected in their general attitudes. Whatever interpretation is placed on the data, they do indicate a striking homogeny.

Of particular significance to the application of learning theory to instructional strategy is the data comparing grade point average to the T.I. and T.O. scales of the OPI. Nine out of eleven students who were below the mean on these two scales and who failed to maintain a grade point average above 2.30 have withdrawn from the program. Table III

Personal dimensions, which appear to relate to a preference for intellectual activity by students in a health technology program, have been reported. Our challenge then is to examine learning theory for its relevance in planning instruction which will enable community college students to function professionally as they move from programs to careers.

Conclusions

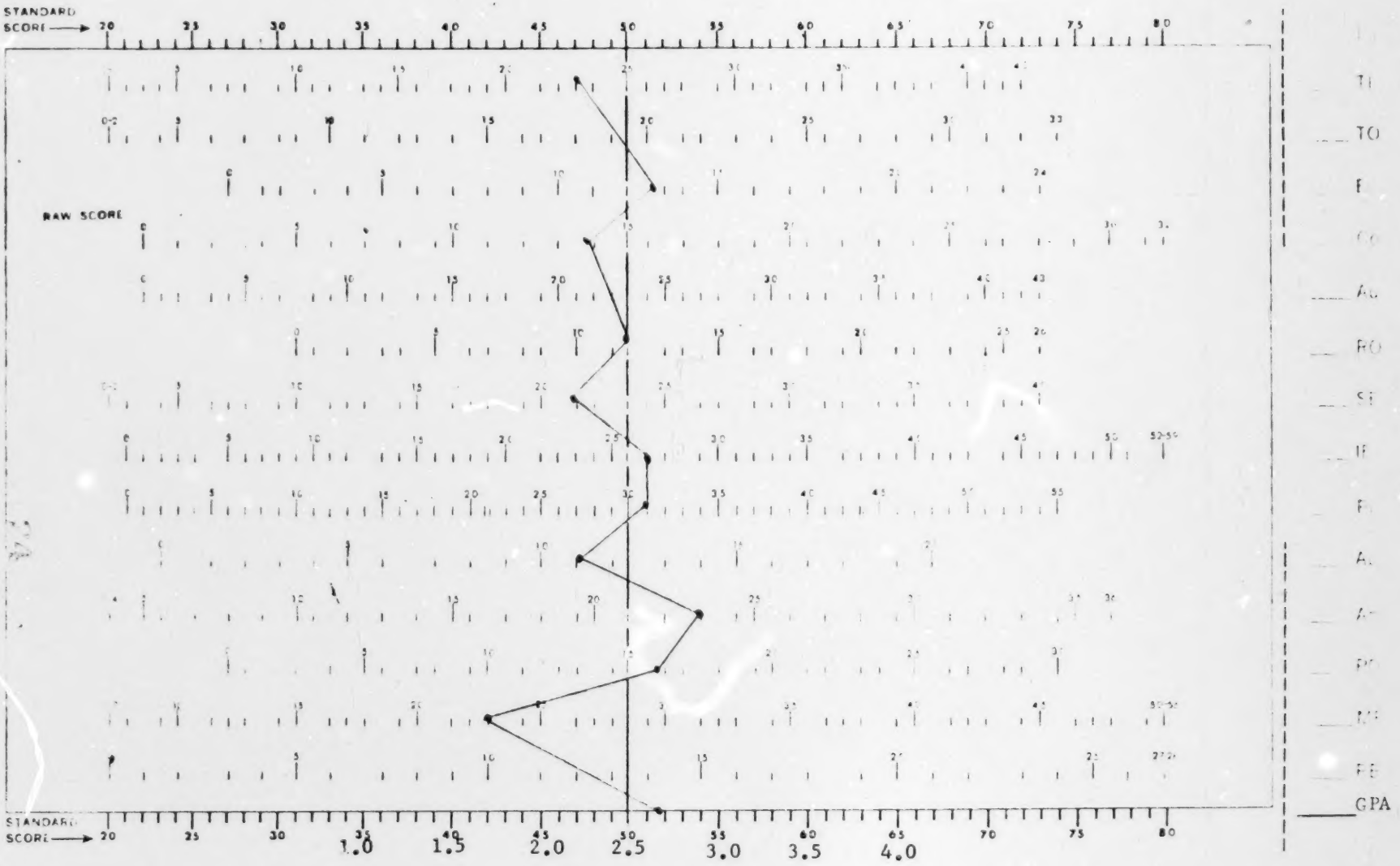
Our hypothesis that a certain intellectual disposition indicating a preference for Thinking Introversion, Theoretical Orientation and Complexity was affirmed in our study. This is particularly significant for

the following two reasons.

(1) In view of a selective admission policy which placed emphasis on academic aptitude scores in evaluating program applicants, it appears a personality inventory would provide additional relevant information to aid in counseling students.

(2) Learning theory can be applied to planning levels of learning and levels of testing for the type of mental processes the student needs to develop.

FIGURE 1



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MEDICAL LABORATORY SCIENCE

OMNIBUS PERSONALITY INVENTORY

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STUDENT NUMBER	THINKING INTROVERSION	THEORETICAL ORIENTATION	ESTHETICISM	COMPLEXITY	AUTONOMY	RELIGIOUS ORIENTATION	SOCIAL EXTROVERSION	IMPULSE EXPRESSION	PERSONAL INTEGRAIONTION	ANXIETY LEVEL	ALTRUISM	PRACTICAL OUTLOOK	MASCULINE - FEMININE	RESPONSE BIAS	GRADE POINT AVERAGE
1															WITHDRAWN
2	15	23	14	17	30	13	21	31	16	10	17	16	23	7	1.87
3	26	28	12	17	12	1	11	16	23	17	16	16	33	18	3.24
4	23	22	8	10	9	10	19	26	28	16	16	19	32	18	3.00
5	14	12	7	5	12	13	16	11	40	14	22	22	32	13	1.30
6	21	28	9	9	15	15	19	21	40	9	21	19	32	18	2.82
7	22	12	14	14	21	7	21	20	26	8	21	7	16	11	3.00
8	19	20	13	17	27	12	20	33	33	9	22	19	22	12	2.58
9	31	28	19	12	20	11	27	19	46	15	29	14	21	22	2.29
10	24	25	11	23	30	12	27	33	33	16	25	7	24	14	2.24
11	31	26	10	18	26	17	27	20	40	12	21	11	23	15	1.83
12	19	13	18	19	32	10	21	44	14	10	21	15	18	5	2.10
13	24	20	16	18	19	8	15	25	38	18	23	14	26	15	3.27
14	17	19	6	6	19	3	19	8	47	19	22	16	34	18	4.00
15	25	20	11	21	32	12	23	30	34	16	20	12	26	8	Withdrew
16	32	23	17	26	37	11	30	35	43	14	29	6	18	16	1.31
17	23	18	9	8	25	12	24	27	27	11	15	13	16	12	3.18
18	17	19	12	16	28	14	28	25	37	15	24	16	28	12	2.55
19	34	15	16	15	36	19	12	30	32	10	23	9	14	11	2.61
20	25	21	14	20	28	9	16	24	32	14	23	12	26	14	1.33
21	26	26	18	25	34	8	22	41	32	14	22	10	25	13	3.71
22	9	15	3	7	27	11	20	16	45	17	24	23	28	16	4.00
23	12	14	18	10	26	13	12	24	21	7	19	21	23	10	3.17
24	33	31	19	22	38	22	14	33	17	9	17	7	29	13	2.90
25	25	22	16	18	33	11	19	33	34	12	28	10	21	12	2.57

MEDICAL LABORATORY SCIENCE

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OMNIBUS PERSONALITY INVENTORY

STUDENT NUMBER	THINKING INTROVERSION	THEORETICAL ORIENTATION	ESTHETICISM	COMPLEXITY	AUTONOMY	RELIEGIOUS ORIENTATION	SOCIAL EXTROVERSION	IMPULSE EXPRESSION	PERSONAL INTEGRAIONTION	ANXIETY LEVEL	ALTRUISM	PRACTICAL OUTLOOK	MASCULINE - FEMININE	RESPONSE BIAS	GRADE PO AVER
26	13	13	18	15	24	15	30	30	23	7	19	21	20	11	2.67
27	33	27	7	8	31	21	9	29	35	13	20	12	35	20	4.00
28	17	19	14	15	18	5	21	36	16	9	18	13	24	12	2.28
29	19	14	10	13	12	13	30	27	46	19	25	24	30	18	2.73
30	36	22	17	21	25	13	27	28	20	8	22	11	14	17	3.38
31	12	16	9	7	18	12	28	30	39	18	23	25	27	14	2.13
32	18	21	14	16	19	14	16	38	20	6	19	20	18	11	1.71
33	17	19	15	16	23	17	27	41	17	6	19	20	24	8	2.19
34	22	24	18	23	24	14	23	36	26	9	21	15	21	16	1.91
35	18	11	6	19	12	10	16	24	30	12	14	24	30	10	2.00
36	32	27	8	14	22	14	27	31	46	16	23	15	34	19	2.13
37	19	13	17	15	18	15	15	35	20	3	14	19	18	9	1.50
38	12	17	9	13	26	21	6	27	37	17	9	19	36	14	2.15
39	32	26	20	22	27	14	24	30	35	11	26	13	20	17	3.28
40	30	22	11	12	30	12	24	21	47	14	26	15	36	16	2.94
41	18	20	5	11	13	6	18	20	37	11	22	20	30	16	1.30
42	26	20	17	14	18	5	19	19	22	9	27	21	19	15	2.20
43	26	26	7	15	34	15	18	38	27	15	13	15	32	10	2.00
44	17	16	8	19	11	10	25	31	34	14	17	22	22	12	1.92
45	22	26	9	16	22	8	15	37	21	11	14	20	34	9	2.43
46	37	26	18	14	26	9	34	22	50	19	31	12	22	25	2.78
47	24	13	17	11	21	7	20	19	45	17	30	17	20	16	3.12
48	30	16	17	14	21	10	34	30	44	18	28	17	25	20	2.73
49	26	22	10	10	12	11	24	17	35	17	17	19	27	18	1.97
50	33	22	18	14	34	19	22	36	19	6	24	13	21	12	3.42

MEDICAL LABORATORY SCIENCE

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OMNIBUS PERSONALITY INVENTORY

STUDENT NUMBER	THINKING INTROVERSION	THEORETICAL ORIENTATION	ESTHETICISM	COMPLEXITY	AUTONOMY	RELIGIOUS ORIENTATION	SOCIAL EXTROVERSION	IMPULSE EXPRESSION	PERSONAL INTEGRATION	ANXIETY LEVEL	ALTRUISM	PRACTICAL OUTLOOK	MASCULINE - FEMININE	RESPONSE BIAS	GRADE POINT AVERAGE
51	28	26	13	15	12	10	21	15	25	12	14	19	27	17	2.47
52	12	16	8	5	13	17	12	31	19	6	15	25	31	11	2.86
53	19	13	16	12	25	15	33	31	31	11	21	17	24	11	2.93
54	25	26	15	18	37	22	19	46	32	17	10	12	37	15	2.09
55	21	16	18	8	15	5	16	24	23	8	13	21	26	14	2.91
56	30	18	14	15	31	9	15	23	18	4	29	9	16	9	
57	14	5	7	6	12	6	20	28	20	3	16	22	17	6	2.00
58	21	18	15	6	18	4	22	12	40	15	20	22	28	19	3.57
59	15	9	13	15	17	8	25	32	26	14	17	19	17	7	4.00
60	21	21	6	10	22	7	23	24	42	14	22	23	31	19	2.79
61	17	18	18	14	21	19	21	44	27	10	15	22	28	11	1.89
62	22	19	15	13	25	10	22	28	26	14	25	15	17	14	1.43
63	26	17	14	16	29	21	24	34	35	16	27	11	18	10	3.09
64	24	15	14	12	23	10	12	25	7	0	13	21	24	11	.00
65	17	17	12	10	16	7	21	27	23	11	16	27	25	12	4.00
66	28	28	9	19	28	16	25	28	43	13	24	19	36	18	1.92
67	12	15	7	13	18	5	19	16	26	12	19	22	28	13	3.00
68	6	11	4	5	24	15	7	20	25	13	14	22	38	6	2.30
69	22	21	12	17	25	15	13	29	23	13	11	15	31	9	3.43
70	20	21	13	17	32	5	27	28	45	18	19	13	28	21	3.85
71	27	24	18	20	32	21	22	28	22	10	18	7	18	15	1.38
72	10	12	7	8	17	8	27	24	11	4	15	20	26	11	
73	24	20	16	22	37	15	29	35	34	17	26	7	21	16	2.71
CLASS MEAN	25	19	12	15	23	11.2	23	26	30	12.3	21	15	28	13.5	2.66

Table II.

SUMMARY OF DATA OBTAINED ON
INTELLECTUAL DISPOSITION SCALES AND
CUMULATIVE GRADE POINT AVERAGE

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(Students who have continued in the Program)

	MEAN	% OF STUDENTS ABOVE MEAN
Cumulative Grade Point Average	2.66	48%
Thinking Introversion Class Mean	25	55%
Theoretical Orientation Class Mean	19	54%
Complexity Class Mean	15	43%

Table III.

STUDENTS WHO HAVE WITHDRAWN
INTELLECTUAL DISPOSITION SUBSCORES AND
GRADE POINT AVERAGE

BELOW MEAN ON: (Student Number)	G.P.A. (2.66)	T.I. (25)	T.O. (19
5	1.30	14	12
12	2.10	19	13
31	2.15	12	16
35	2.00	18	11
37	1.50	19	13
38	2.15	12	17
44	1.92	17	16
57	2.00	14	3
61	1.89	17	18
64	.00	24	15
68	2.30	6	11

SUMMARY

FROM PERSONAL DATA QUESTIONAIRRE

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Average age	22
Age range	17-45
Number under 21	45
Number over 21	28
Percent male	25%
Percent married	36%
Plan to work as MLT	100%
Aspire to a Bachelor's Degree	48%
Consider their present age happiest	72%
Are gainfully employed 10 hours or more per week	45%
Withdrawals by midterm of Term II	15%
Graduates School year 1973-74	21%

RECOMMENDATIONS

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The particular data presented appear relevant to the intellectual disposition categories. Although restricted to students in medical laboratory science, the data are consistent and supportive of the hypothesis underlying this systematic attempt at revealing a correlation between personality profiles and dropout propensity. Therefore we recommend that:

(1) Every student enrolled in a health technology program take a Personality Inventory.

(2) The results of this Inventory and its professional interpretation be available to him, and his Program Director, through the Office of Student Services.

(3) Teaching procedures in health technologies be systematically developed and evaluated for a level of teaching and learning which encourage problem solving, reflection, concept and principle exploration, purposive involvement, and cooperative inquiry.

The appendix contains examples of learning experiences which relate to learning theory and a particular intellectual disposition based upon the third recommendation.

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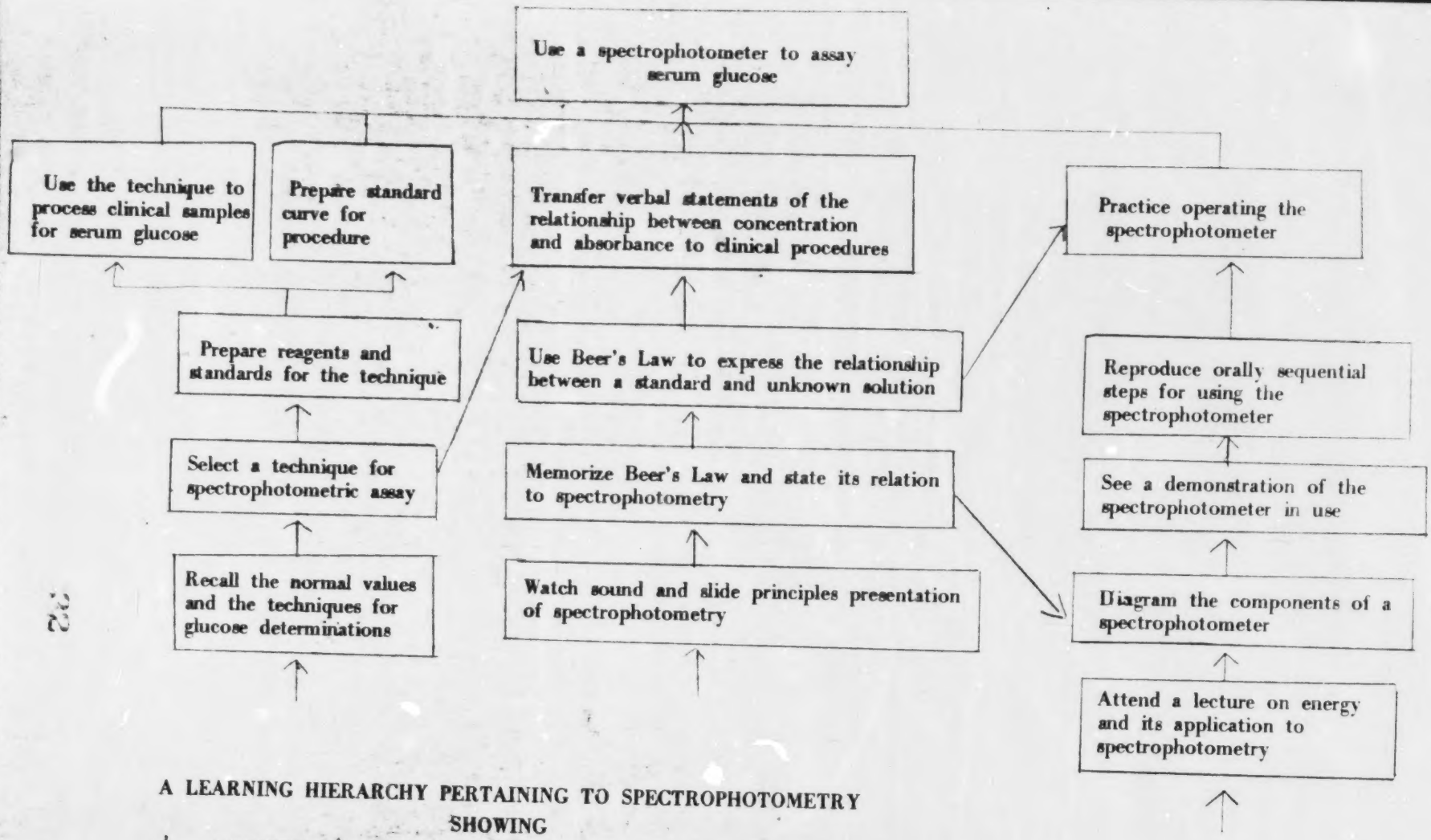

A LEARNING HIERARCHY PERTAINING TO SPECTROPHOTOMETRY
SHOWING
REQUISITE, VERBAL, AND SEQUENTIAL SKILLS

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A

PROGRAM

FOR

LEARNING

HEMATOLOGY

The Learner's Manual

Basic Concepts in Hematology

By Laura A. Wiesenfeld

PREFACE

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IN THIS PROGRAMMED COURSE OF INSTRUCTION YOU WILL STUDY THE BASIC HEMATOLOGY REQUISITE FOR A FIRST COURSE IN CLINICAL HEMATOLOGY. CLINICAL HEMATOLOGY COMPRISES THE INFORMATION OBTAINED FROM THE DIAGNOSTIC LABORATORY PROCEDURES INVOLVING THE EXAMINATION OF PERIPHERAL BLOOD, VENOUS BLOOD, AND BONE MARROW ASPIRATIONS. MORPHOLOGIC AND PHYSIOLOGIC DATA, DERIVED FROM HEMATOLOGIC TECHNIQUES, ARE NEEDED TO COMPLETE THE CLINICAL STUDY OF PATIENTS AND TO ASSIST THE PHYSICIAN IN THE DIAGNOSIS OF DISEASE. IF THESE RATHER PONDEROUS NEW TERMS ARE FRIGHTENING THEN THIS BOOK IS FOR YOU BECAUSE IT IS DESIGNED FOR YOU, THE LEARNER.

ALTHOUGH MEDICAL LABORATORY PERSONNEL OFTEN LEARN USEFUL HEMATOLOGICAL PROCEDURES, THEIR PERFORMANCE OF THE MEDICAL TECHNIQUES OF HEMATOLOGICAL INVESTIGATIONS IS NOT TO BE CONFUSED WITH ACTUAL KNOWLEDGE OF HEMATOLOGY. FOR THAT REASON THESE EXERCISES IN HEMATOLOGY ARE DESIGNED TO HELP YOU ACHIEVE THE FOLLOWING GOALS:

(1) YOU WILL UNDERSTAND THE BASICALLY FUNDAMENTAL OR SUPPLEMENTAL CONCEPTS FOR THE SKILLFUL PRACTICE OF CLINICAL HEMATOLOGICAL TECHNIQUES,

(2) YOU WILL ACQUIRE A FRAMEWORK FOR THE MORPHOLOGICAL DIFFERENTIATION OF BLOOD AND BONE MARROW CELLS,

(3) YOU WILL ACQUIRE THE NECESSARY HEMATOLOGIC PRINCIPLES AND FOUNDATION MATERIALS TO INCREASE YOUR COMPREHENSION OF THE QUALITATIVE AND QUANTITATIVE PROCEDURES FORMING THE BASIS OF HEMATOLOGICAL DIAGNOSIS.

MODULE I

INTRODUCTION TO HEMATOLOGY

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Guidepost: Briefly stated, Hematology is the study of blood and its formed elements. Many of the young blood cells normally exist only in the bone marrow and appear in the peripheral blood only in disease. Blood is man's only fluid tissue.

Unit I - Hematology is the sum total of the techniques and the information derived from these hematological studies as they are used in patient care.

Key Words:

Bone marrow
Lymph
fetal
hematopoiesis
nucleated
disc
cubic millimeter
coagulation
platelets
hematological
hemoglobin
leukocytes
cyte
cytopenia
oxygen
carbon dioxide
erythrocyte
plasma
phagocytosis
thrombocyte

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This module is written with you in mind and is the learner's manual; upon finishing the learning experiences provided in this unit you will be able to:

(1) Define hematology and use the key words correctly, using the text as your reference.

(2) List the formed elements of blood and classify them in three major divisions based on morphology and function with 100% accuracy.

(3) State the size and function of erythrocytes according to the information in section eleven.

(4) State the size and function of leukocytes according to the information in section twelve.

(5) Classify leukocytes into three classes with 100% accuracy.

(6) State the size and function of platelets according to the information in section fourteen.

(7) Recognize the overall criteria for neutrophilic maturation with 80% accuracy.

(8) Apply these criteria to other cells of the leukocytic series with 100% accuracy.

(9) Recognize that the laboratory technician's work reflects the patient's health and requires careful responsible work.

(10) State the distinguishing morphology and the unique role of blood platelets using the information in this unit as your reference.

When you come to a blank space try to fill it in without checking the answer first.

The complete clinical study of any patient requires diagnostic laboratory procedures involving_____

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The word hematology is derived from the Greek word aima (blood and logos (science), literally translated, "the study of blood." A _____ is one who specialized in the study of blood.

Hematologist Frame 2

Blood itself is a red fluid of variable composition circulating through the blood _____ of the body. It participates in the physiologic activities of all the body cells.

---

vessels Frame 3

Blood is composed of a liquid called plasma in which the _____ elements are suspended.

---

cellular Frame 4

Because hematology concerns the sum of the blood cells produced, the blood cells released into the peripheral (a)_____, and the blood cells that survive, the abnormalities found in cells of the peripheral blood reflect an imbalance between cell production, cell release, and (b)_____ survival.

(a) circulation (b) cell Frame 5

The hematopoietic system comprises that organ complex associated with the _____ elements of the blood and the manner and loci of their formation and function.

---

morphologic Frame 6

Hemopoiesis (aima + poicin) derives from the Greek words meaning blood and to form. A synonym for hemopoiesis is _____

hematopoiesis Frame 7

The vascular system comprises the arrangement of vessels circulating all the body (a)_____ including the heart, (b)_____, capillaries, veins and lymphatics.

(a) fluids (b) arteries Frame 8

The study of hematology deals with the morphologic elements, sometimes called formed elements or (a)_____components, and the fluid in which they are (b)_____.

(a) cytological (b) suspended Frame 9

If we withdraw blood from the vascular system and prevent clotting the hemocytes (also known as the)_____ _____ of the blood can be separated from the plasma.

formed elements Frame 10

From section #10 we learn that blood which contains an anticoagulant can be separated into formed elements and (a)_____. Blood contains fibrinogen and other coagulation factors which form a fibrin clot at the site of an injury to a blood vessel. Serum contains no fibrinogen. It is removed as insoluble fibrin threads in which the (b) _____ _____ are meshed.

(a) plasma (b) Blood cells Frame 11

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Human blood cells may be classified into three major divisions based on morphology and function. They are erythrocytes (a)_____ leukocytes (b)_____ and thrombocytes (platelets).

(a) red blood cells (b) white blood cells Frame 12

Any variation in the number, shape, and function of one or more of these cell series of the (a)_____ will produce and (b)_____ symptom complex called a blood dyscrasia.

(a) blood (b) hematological Frame 13

The erythrocyte is an elastic biconcave disc lacking a nucleus and measuring 7.2 micra in diameter. It has an average life span of 120 days. Erythrocytes carry hemoglobin as a respiratory pigment in the form of oxyhemoglobin. The main function of erythrocytes is to transport hemoglobin with its associated oxygen and (a)_____ dioxide.

(a) carbon Frame 14

Unstained erythrocytes are a pale greenish yellow due to the presence of (a)_____. Erythrocytes stain (b)_____ with Wright's or Romanowsky stain.

(a) hemoglobin (b) Eosin Red Frame 15

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The leukocyte or(a) _____ _____ ___ is a living nucleated cell 8-12 in diameter. It's life span varies. It occurs in both peripheral blood and (b)_____ _____. In peripheral blood leukocytes are composed of polymorphonuclear cells, lymphocytes, monocytes, and plasma cells.

(a) white blood cells (b) bone marrow Frame 16

The life span of our first lines of defense or the polymorphonuclear cells is three to four days, of lymphocytes is approximately one hundred days, and of moncytes two days to two weeks. The life span of _____ cells is of unknown durations.

---

plasma Frame 17

Leukocytes are identified by certain nuclear and cytoplasmic morphology and (a) _____characteristics, when the Romanowsky stains are used. Each series of (b)_____ fulfills a protective role in defending the body against (c)_____, by (d)_____ and/or pinocytosis and immune antibody formation.

(a) staining (b) leukocytes (c) disease Frame 18
(d) phagocytosis

The thrombocyte (G. thrombos, a clot, + kytos, cell) or a _____ is a morphologically irregular, thin, discoid cell, round or oval in outline, with a smooth, well defined limiting membrane. Platelets vary from 2 to 4 micra in (b)_____ and are derived from the cytoplasmic portion of megakaryocytes, the (c)_____ cell.

(a) platelet (b) diameter (c) parent BEST COPY AVAILABLE

Megakaryocytes are the (a)_____ cells of the bone marrow. The thrombocyte stains purple red with the (b)_____ stain. The thrombocyte is the most fundamental factor in (c)_____ inasmuch as it appears to function in all the known mechanisms utilized by the body to control the loss of (d)_____.

(a) giant (b) Romanowsky (c) hemostasis (d) blood Frame 20

Hematological examinations require a properly collected blood (a)_____. If the laboratorian understands that blood is the only fluid tissue, he will perform (b)_____ techniques carefully and accurately to insure that this (c)_____ tissue biopsy accurately reflects the patient's state of (d)_____.

(a) sample (b) hematological (c) fluid (d) health Frame 21

Summary: You have completed your first unit, congratulations. If you wish to reinforce your knowledge review the objectives. In this way you will know you have learned the material in this unit. Did you? Proceed.

A Criterion Referenced Evaluation to
Measure Mastery
of the
Complexities of the Clinical Situation

1. A physician has ordered a stat urinalysis on Fu Wong. He requests you to do it without first logging in the specimen because he must leave for a meeting:

   (a) you comply
   (b) you do not comply but you log in, explain why, and do the stat immediately
   (c) you comply but answer a call in the E. R. first
   (d) you do not comply and do the stat in order of its arrival

2. The first morning specimen of urine is requested often because:

   (a) the patient rested all night
   (b) the urine remained in the bladder for a longer time
   (c) the urine is more concentrated
   (d) this specimen is easier to collect

3. Which of the descriptions best fits the following crystals:

   a. Calcium Oxalate
   b. Uric Acid
   c. Triple phosphate
   d. Calcium carbonate

   1. Prisms and "coffin lids"
   2. Many forms-colored plates, prisms, hexagons, etc.
   3. Colorless, octahedral squares with double diagonal lines
   4. Dumbbell or shperical forms

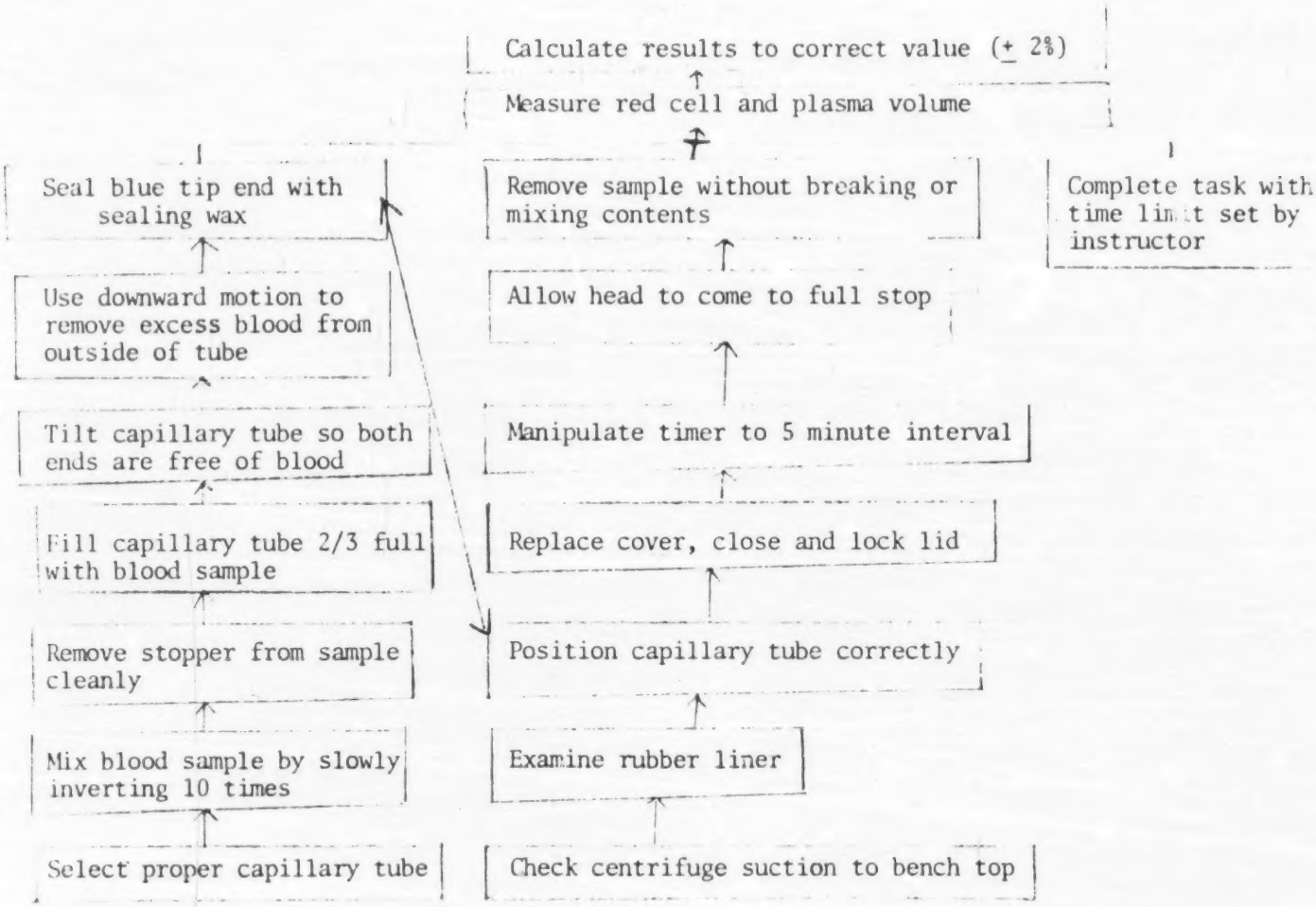
4. If urine specific gravity reads above 1.026 on the T. S. meter you should:

   (a) ask for another specimen
   (b) report it above 1.026
   (c) report it as 1.026
   (d) dilute it 1-1 with distilled water and double the last two figures

5. Combistix may become unreliable if they are:

   (a) not used immediately
   (b) subjected to cold
   (c) allowed to absorb moisture
   (d) not used at room temperature

LEARNING HEIRARCHY FOR ACQUISITION OF A SKILL
CHAINING AND PROCEDURE



FLOW CHART TO BE USED IN IDENTIFYING AN UNKNOWN BACTERIUM

ORDER: _____

FAMILY: _____

GENUS: _____ SPECIES

1. MORPHOLOGY _____
2. GRAM STAIN _____
3. FLAGELLA _____
4. SPORES _____
5. O_2 REQUIREMENT _____
6. MEDIA
   a. _____
   b. _____
   c. _____
   d. _____
   e. _____
   f. _____
7. COLONIAL CHARACTERISTIC _____
8. CARBOHYDRATES
   a. _____
   b. _____
   c. _____
   d. _____
   e. _____
9. BIOCHEMICAL TESTS
   a. _____
   b. _____
   c. _____
   d. _____
   e. _____
   f. _____
   g. _____
   h. _____
   i. _____
10. ANTIBIOTICS
    susceptible to: _____
    resistant to: _____
11. Ag/Ab TESTS _____

    OTHER _____
12. DISEASES PRODUCED BY: _____
13. NORMALLY FOUND: _____

This exercise is used to develop judgement in Evaluation.

QUESTIONNAIRE PERSONAL DATA

1. Name_____

2. Student Number_____

3. Date_____

4. Birth Date_____
Month Day Year

5. Male_____ Female_____

6. Check: A.S. Degree Program _____ Certificate Program_____

7. Have you attended another college: Yes_____ No_____

8. Is this your 1st_____ 2nd_____3rd_____4th_____6th_____term at FJC

9. Check one: Out of school employment

(1) _____ None

(2) _____1-10 hours

(3) _____11-19 hours

(4) _____20-29 hours

(5) _____30-39 hours

(6) _____40 hours or more

10. Five years from now I would like to be:

(1) _____ a student

(2) _____a medical laboratory technician

(3) _____married and raising a family

(4) _____a medical technologist with a Bachelor's degree

(5) _____in any field which can utilize the skills of the medical laboratory

(6) _____in any field in which I can earn the most money

(7) _____don't know

11. Marital status _____single _____married

12. I consider the following to be the happiest years of one's life. Check one.

(1) 1-4
(2) 5-9
(3) 10-14
(4) 15-19
(5) 20-29
(6) 30-39
(7) 40-49
(8) 50-59
(9) 60 or 60 plus

13. Pick the grade closest to your high school average.

(1) _____D (2)_____C (3) _____B (4) _____A

14. What is your cumulative grade point average?

(1) _____1.5 (2) _____2.0 (3) _____2.5 (4) _____3.0

(5) _____3.5 (6) _____4.0

15. Were you born in Florida? Yes_____ No_____

16. How many years have you lived in Duval or Nassau counties? _____

17. How many different schools did you attend before the 10th grade? _____

18. How many different schools did you attend from grades 10 to 12? _____

FAMILY DATA

19.	Father	Mother
(1) Living at home	_____	_____
(2) Living away from home	_____	_____
(3) Deceased	_____	_____
20. Occupation of Parent		
(1) Professional	_____	_____
(2) Semiprofessional	_____	_____
(3) Skilled	_____	_____
(4) Semiskilled	_____	_____
(5) Unskilled	_____	_____
(6) Retired	_____	_____

21. Educational Level of Parent	Father	Mother
(1) Did not complete high school	_____	_____
(2) High school graduate	_____	_____
(3) Some college	_____	_____
(4) College graduate	_____	_____
(5) Post-graduate work in college	_____	_____
(6) Don't know	_____	_____

22. Brothers _____, Sisters _____ number of each

23. Check the appropriate box, are you the

eldest_____ about middle_____ youngest _____?

24. I live with: (1) one or both parents_____ (2) husband or wife_____

(3) friend or friends_____ (4) grandparents_____ (5) alone_____

25. If married - do you have children? boys_____ girls_____

Ages of children _____

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